

# **ENGINEERING DESIGN DOCUMENTS**

## **PURPOSE**

This document will provide an overview, general definitions, and make recommendations for the administrative processing (Document Control) of Engineering Design Documents.

## **SCOPE**

The contents will pertain to Engineering Design Documents that include Design Drawings, Calculations, Specifications, Design Change Notices (DCNs), and provide some general information on the drafting standards utilized by the industry. Considerations relative to packaging and filing these records are also provided.

## **INTRODUCTION**

Methods of creating, capturing, editing, maintaining, transmitting, retrieving, and storing Federal records are continuously changing. The result is an increase in the volume and complexity of created and stored information. Records, in addition to hard copy media, can now be found in a variety of electronic media. Records may include text, graphics, sound recordings, or video recordings generated from a variety of software. Documents created during the engineering design phases of a project may also include installation, testing, operating and maintenance instructions, and supporting equipment or component lists. Complex records may be composed of multiple computer files stored in multiple locations, paper records or a combination of both electronic and hardcopy documents.

## **OVERVIEW**

Information, including Engineering Design Documents, and its proliferation must be managed properly to ensure that electronic records are controlled, protected, and retained in accordance with approved records disposition schedules. To achieve this goal, records personnel are expected to coordinate records programs with originators of records, organizational administrators, program managers, and computer systems managers. The intent is to ensure that all information including drafts of documents, deleted files, and extraneous copies of records are identified, controlled, and properly dispositioned.

The Records Disposal Act (44 USC 3301) defines records as “. . . all books, paper, maps, photographs, machine readable materials, or other documentary materials, regardless of physical form or characteristics, made or received by an agency of the United States Government under Federal law or in conjunction with the transaction of public business and preserved or appropriate for preservation by that agency or its legitimate successor as evidence of the organization functions, policies, decisions, procedures, operations, or other activities of the Government or because of the informational value of the data in them.” Thus, any engineering documents that are created or received in the course of official business and maintained to document Government activities are Federal records.

The legal admissibility of records pose no great problems as long as there is a proven effective record keeping system implemented. Procedures must be established and implemented such that 1) the date of the record can be determined, 2) that evidence is maintained relative to the date of any alterations and the identity of the person making that alteration, and 3) there is evidence that the record was authorized to be issued.

Across government and industry, much of the definition of how electronic records are to be managed is still being formulated and refined. To some degree, therefore, the administrative controls must be developed relying on expertise of professional records personnel. This guide reflects the thinking and best business practices of a broad array of talent relating to records, documents, and information management.

## DEFINITIONS

See Appendix A

## RECOMMENDATIONS FOR ADMINISTRATIVE PROCESSING

### Design Drawings

The Engineering group will develop the design drawing(s) based on the needs of a project and upon receipt of specific design input criteria or requirements. Upon receipt of a drawing from Engineering, record personnel should first verify that the drawing is accurately titled, numbered, and appropriately signed; and that the revision date is indicated. Second, verify that the revision indicator in the title block and the revision note line agree with the latest revision (if previously registered) shown in the Document Management System. Third, verify that the document is sufficiently legible to scan and produce clear, clean, readable copies. If the drawing is transmitted electronically, it should be the originating organizations responsibility to provide adequate indexing information about the document: Title, Document Number, Date, Author, etc.

At a minimum, the following information should be input into the Document Management System:

- \*Drawing number
- \*Revision
- \*Title
- \*Activity code (if applicable)
- \*Project number (if applicable)
- \*Date distributed (if applicable)
- \*Design Change Notice (DCN) (if applicable)
- \*Comments (as applicable)

Various sites may have additional information that they wish incorporated into their system. These additional pieces of information may include such things as area, building number, CAD file number, etc. These pieces of information are important and often reflect the interest of the customer and how they will request retrieval of said documents.

In addition, sites could have additional information incorporated into their drawing numbering format. At a minimum, the formatted number should include:

- \*Project or site identifier (if applicable)
- \*Discipline identifier (M=mechanical, C=civil, E=electrical, etc.)
- \*Sequential number
- \*Distribution Code
- \*Status (Approved for Construction, As-Built, etc)

Certain sites may wish to build additional intelligence into their numbering format. These items could include additional information such as building numbers, area numbers, etc.

**NOTE:** Careful scrutiny should be made to additional information, which may be included in the drawing number. Many times people will try to build too much information into their number and the number will become unwieldy and confusing.

When voiding or superseding a design drawing, a formal revision should be initiated. This status/revision should be noted in the Document Management System being utilized and the drawing shall then be marked or stamped "Void" or "Superseded" as appropriate.

The aforementioned steps should be documented in step-by-step procedures, which reflect the individual needs of sites and projects. All personnel should be trained to these procedures to alleviate confusion and promote sound record keeping and retrieval practices.

### Specifications

The Engineering group will develop the specification (see appendix A for definition) based upon design, procurement, construction, or fabrication requirements. Upon receipt of a specification from Engineering, record personnel should first verify that the specification is accurately titled, numbered, complete, and appropriately signed. A signature from an independent checker who has verified the adequacy of the specification is normally required. Second, verify that the revision indicator agrees with the latest revision (if previously registered) shown in the Document Management System. Third, verify that the document is sufficiently legible to scan and produce clear, clean, readable copies.

At a minimum, the following information should be input into the Document Management System:

- \*Specification number
- \*Revision
- \*Title
- \*Originator

Various sites may have additional information that they wish incorporated into their system. These pieces of information are important and often reflect the interest of the customer and how they will request retrieval of said documents.

Sites could have additional requirements incorporated into their specification numbering format. At a minimum, the formatted number should include:

- \*Document identifier (SP for specification)
- \*Project/Task number
- \*Discipline (M=mechanical, E=electrical, C=civil, etc.)
- \*Sequential number

The aforementioned steps should be documented in step-by-step procedures, which reflect the individual needs of sites and projects. All personnel should be trained to these procedures to alleviate confusion and promote sound record keeping and retrieval practices.

### Design Change Notices (DCNs)

Engineering Change Documents such as DCNs (see appendix A for definition) are an important tool utilized by Engineering when a full revision is not required for a drawing or specification. DCNs are a good business practice as they are time and cost effective. Upon receipt of a DCN from Engineering, record personnel should first verify that the referenced drawing/specification number is correct and that the DCN is accurately titled, numbered, and appropriately signed. Second, verify that it is sufficiently legible to scan and produce clear, clean, readable copies. Third, verify that multi-sheet DCNs are in sequence and inclusive.

At a minimum, the following information should be input into the Document Management System:

- \*DCN number
- \*Referenced drawing/specification number(s)
- \*Title
- \*Activity code (if applicable)
- \*Project number (if applicable)
- \*Date distributed (if applicable)
- \*Comments (as applicable)
- \*Approval Date
- \*Status
- \*Distribution Code

When a DCN is scanned into the Document Management System, it should be linked to the drawing/specification that it is written against. This allows the customer to get an overall picture of what changes have occurred to the drawing as it is prepared for the next revision.

The aforementioned steps should be documented in a step-by-step fashion but are normally incorporated into existing drawing or specification procedures. Rarely would a separate procedure be required.

### Calculations

The Engineering group will develop a calculation (see appendix A for definition) based upon input criteria and assure that it is sufficiently detailed as to purpose, method, assumptions, design input, and references. Like a specification, a signature from an independent checker who has verified the adequacy of the calculation and that the calculation is accurately titled, numbered, and complete is normally required. Upon receipt of a calculation from Engineering, record personnel should first verify that the revision indicator agrees with the latest revision (if previously registered) shown in the Document Management System and that the calculation is appropriately signed. Second, verify that the document is sufficiently legible to scan or film and produce clear, clean, readable copies.

At a minimum, the following information should be input into the Document Management System:

- \*Calculation number
- \*Revision
- \*Title
- \*Originator
- \*Approval Date

All changes to an approved calculation should be accomplished by a revision to the calculation. DCNs are normally not used as a change to the document. Individual pages may be revised, deleted, new pages inserted, and/or new pages added to the end of the calculation as appropriate to properly reflect the necessary changes. All changes made to the calculation should be clearly indicated on the revision by change bars, and explanatory notes as necessary. In addition, the pages that have been changed, added, or deleted should be listed on the cover sheet or continuation page.

When voiding or superseding a calculation a formal revision should be prepared. Normally the cover sheet of the voided or superseded calculation need only be initialed and dated. The calculation should then be marked or stamped "Void" or "Superseded" as appropriate. A notation to that affect should also be made in the Document Management System.

Sites could have additional requirements incorporated into their calculation-numbering format. The calculation number may be constructed to provide additional information concerning the creation and use of the calculation. If this is desired, the formatted number may include such things as:

- \*Document identifier (C for calculation)
- \*Discipline (M=mechanical, E=electrical, C=civil, etc.)
- \*Sequential number
- \*System
- \*Corrective Action Document Number (if appropriate)

The aforementioned steps should be documented in step-by-step procedures that reflect the individual needs of sites and projects. All personnel should be trained to these procedures to alleviate confusion and promote sound record keeping and retrieval practices.

## **FILING AND STORAGE PRACTICES**

### Project vs. Record Type Files

Two logical approaches exist towards filing of engineering records; i.e., the records may be filed together with the other records related to the specific “project” requiring their creation or they may be filed with other records of the same type. The selection of the storage method to be used at a location should be decided based on the needs of those who will be managing the documents. The following considerations will apply to the decision:

- \* *Filing with other Project records* -- this method allows all of the project records to be stored together thus facilitating the retrieval of the documentation related to that project. However, this approach will mix record types within a file creating difficulties in the disposition of shorter-lived records within the package. Additionally, this approach will necessarily require that an individual record be stored multiple times if it is used on more than one project.
- \* *Filing Record types together, with sufficient documentation of the revision used placed in the Project records* -- this method facilitates the revision control aspects of the control of these documents. Many engineering records are reused on different projects without change and this approach will allow the record copy to be filed only once. Document Revision Control for these Records will be simplified under this approach. Retrieval of the specific revision of the engineering record from the cross-index requires an additional retrieval operation, however this should not be burdensome. Cross-indexing should be accomplished within scope of the normal indexing/metadata process. Use of repeating fields for project #, facility, etc. is typical in Document Management Systems. There would be no significant additional costs.

While the decision as to which approach should be used at any DOE site depends on the situation at that site, the second approach is recommended. The advantages in maintaining the revision control and reducing the stored volume of records are evident. Note that if a computerized index is used for retrieval, both the project and the revision identification can be used to obtain the correct record.

### Packaging of Records

The inputs used in developing an engineering design record should be filed with the final record where possible, as long as the inputs are not a separate engineering design records themselves. If the inputs are a separate engineering design record, references to the input records, including the appropriate revisions, should be provided in the text of the engineering design record.

Interim revisions of an engineering design record should be retained for the duration specified in the appropriate Records Disposition Schedule. For example, a drawing issued “For Review” may be replaced with a subsequent revision issued “For Construction”, if allowed by the approved Records Schedule.

## OVERVIEW OF INDUSTRY DRAFTING STANDARDS

Drafting standards, while not directly applicable to records personnel, do indirectly affect the way that we support drawing control. It is useful to know what Engineering bases their decisions on and can assist you with things like reproduction (size of paper), understanding the content of documents (specifically drawings), and electronic file management and the utilization of memory.

The primary control exerted over drawing creation is from the CAD application itself. The capabilities and limitations of the application dictate much of what becomes the standard approach to drawing creation. Most Engineering groups base the creation of drawings on discipline trade standards that are in accordance with nationally recognized drafting standards. Common sense rules apply such as the use of abbreviations should be minimal and used only when room is critical on the drawing or when repetition of a common phrase is incessant. Most times text appears in upper case and is consistent throughout the drawing. Periods are rarely used at the end of sentences.

Drawing sheet sizes are based upon Architectural and ASME standards

Architectural	Size A	8-1/2" x 11"	Left border 1", all others 1/4"
Architectural	Size B	11" x 17"	Left border 1", all others 1/4"
Architectural	Size C	17" x 22"	Left border 1 1/2", all others 1/2"
Architectural	Size D	24" x 36"	Left border 1 1/2", all others 1/2"
Architectural	Size E	34" x 44"	Left border 1 1/2", all others 1/2"
ASME	Size A	8-1/2" x 11"	Horz Margin .38", Vert Margin .25"
ASME	Size B	11" x 17"	Horz Margin .38", Vert Margin .62"
ASME	Size C	17" x 22"	Horz Margin .75", Vert Margin .50"
ASME	Size D	22" x 34"	Horz Margin .50", Vert Margin 1.00"
ASME	Size E	34 x 44	Horz Margin 1.00", Vert. Margin.50"

## SUMMARY

These guidelines are issued as recommendations to be followed for the control and processing of Engineering Design Documents. These recommendations should be implemented in conjunction with site-specific procedures. Equipment, software, and/or supplies are the responsibility of the affected site.

## **APPENDIX A**

### **GLOSSARY OF TERMS**

**Calculation** – A documented mathematical process, and its results, performed to determine requirements or actual designs applicable to construction, fabrication, equipment, or studies.

**Change Bars** – A notation that the content has been modified from the previous version. As used in this document, change bars may be a vertical line located in the margins (usually in the outside margin) or for drawings may be depicted as a “cloud” circling the changed information. Other methods indicating a change in the document may be used as prescribed in governing procedures or guidelines.

**Design Change Notice (DCN)** – The Design Change Document issued by the responsible design organization that officially authorizes modification to an issued drawing or specification, prior to the issuance of a formal revision to incorporate the modification. A DCN may also be known as a Field Change Request (FCR), or other similar title as defined in the organization’s design procedures.

**Design Document(s)** – A document or set of documents (e.g., drawings, specifications, calculations, etc.) developed to address specific design input requirements that when reviewed, approved and implemented will produce a completed design output or deliverable.

**Design Drawing** – A drawing originated or issued by Engineering that shows details of design work.

**Document Control** - The overall management of the separate processes of identifying, indexing, distributing, storing, and retrieving all required documents associated with a project or site

**Specification** - A statement or enumeration of particulars, as to actual or required size, quality, performance, terms, etc.

**Issuance** – The formal distribution of design documents after they have been administratively processed.

**Record Copy** – The original design document (or designated copy for recordkeeping purposes) that has been processed for issuance.